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The Patent Office
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Cardiff Road
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REC'D 23 AUG 2000
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1/77

05JUL99 E459229-5 D02884
P01/7700 0.00 - 9915487.4

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

-3 JUL 1999

The Patent Office
Cardiff Road
Newport
Gwent NP9 1RH

1. Your reference — P240381/HGR/GMU

2. Patent application number *(The Patent Office will fill in this part)* — **9915487.4**

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

Rocep Lusol Holdings Limited
Rocep Business Park
Kings Inch Road
Deanpark
RENFREW
PA4 8XY

Patents ADP number *(if you know it)* 6837694001

If the applicant is a corporate body, give the country/state of its incorporation — United Kingdom

4. Title of the invention

"A Valve for use with Apparatus for Introducing a Predetermined Dose of Additive into a Liquid"

5. Name of your agent *(if you have one)* — Murgitroyd & Company

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

373 Scotland Street
GLASGOW
G5 8QA

Patents ADP number *(if you know it)* 1198013

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing *(day / month / year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:*

a) any applicant named in part 3 is not an inventor, or
b) there is an inventor who is not named as an applicant, or
c) any named applicant is a corporate body.
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Yes

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Continuation sheets of this form	
Description	11
Claim(s)	0
Abstract	0
Drawing(s)	3

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Priority documents	–
Translations of priority documents	–
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	–
Request for preliminary examination and search *(Patents Form 9/77)*	–
Request for substantive examination *(Patents Form 10/77)*	–
Any other documents *(please specify)*	–

11. I/We request the grant of a patent on the basis of this application.

Signature Murgitroyd & Co Date 2 July 1999

Murgitroyd & Company

12. Name and daytime telephone number of person to contact in the United Kingdom

Graham Murnane
0141 307 8400

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A valve for use with apparatus for introducing a predetermined dose of additive into a liquid

The invention relates to a single use valve which allows fluid to pass from the interior of a tube to the exterior, and in particular to a valve for use with a container which automatically adds an additive in the form of a liquid or a pourable solid to a liquid in the container on opening of the container.

In a wide number of applications, such as pharmaceuticals for both human and animal use, agrochemicals and other more general applications it may be necessary to release and mix a liquid catalyst or reagent into a liquid before the liquid may be used. In other applications, such as in the beverage industry, it may be desirable to add a component to a beverage immediately before consumption of the beverage, for example to effect a colour change, or to create a mixed beverage which has a limited storage life in the mixed state.

British Patent Application No 9823578 discloses an apparatus for introducing a component into a first liquid, the apparatus comprising a first container ,

such as a bottle, which holds the first liquid. The container has an opening closed by a releasable closure. A second container or tank containing pressurised propellant fluid is positioned in the neck of the first container, adjacent to the opening. A dip tube or conduit is attached to the tank, and has a first end communicating with the tank and a second end extending down into the first liquid in the first container. The dip tube contains an additive which is expelled from the dip tube into the first liquid by the entry of the propellant fluid from the tank into the conduit on release of the releasable closure.

The preferred form of dip tube is a polypropylene tube of circular cross-section, typically having an internal diameter of 5.8 mm. Such a tube has an internal capacity of 0.26 ml for each 10 mm length, so an 80 mm long tube can hold approximately 2 ml of product. The tank typically has a capacity of 2 ml, and contains pressurised propellant gas.

When the tank is of an impermeable material such as metal, then the headspace required for the propellent gas is only a proportion of the total tank volume, leaving the remainder of the tank volume available for product.

However when the tank is of a material such as plastic which exhibits long term permeability, then the headspace required for the propellent gas must be maximised, and none of the tank volume is available for product. In such cases it can be necessary to use larger diameter dip tubes capable of holding more product, and there is then a need for a valve arrangement at the lower end of the dip tube so that product does not drip into the first liquid in t

first container. The use of small diameter dip tubes such as capillary tubes avoids the need for valves, but such small diameter dip tubes can only hold a small amount of product.

There is therefore a need for a simple, inexpensive valve arrangement which prevents the product in a dip tube from leaking or dripping into the first liquid in the first container when the dip tube and first container are at the same pressure, but which allows the passage of liquid or pourable solid product from the dip tube into the first liquid in the first container when the dip tube is pressurised by introduction of the propellant fluid.

According to a first aspect of the present invention there is provided a valve comprising a hollow tubular member having a flattened end portion of resilient plastics material, the flattened end portion comprising two opposing walls held in contact with each other by the resilience of the plastics material and adapted to move out of contact with each other when the hollow tubular member is subject to internal pressure.

Preferably the flattened end portion is formed by applying heat to the tubular member. Preferably the heat is sufficient to cause plastic deformation of the material, but not sufficient to cause melt bonding of the opposing walls.

The two opposing walls may be substantially planar. Alternatively the two opposing walls may be arcuate in transverse section, the outer surface of a first one of the opposing walls being in contact with the inner surface of the second one of the opposing walls.

The flattened end portion may comprise one or more transverse folds. Alternatively the flattened end portion may be curved or bent about a transverse axis. The flattened end portion may be rolled about a transverse axis.

Preferably the tubular member is of plastic, most preferably of polypropylene. Preferably the tubular member is of circular cross-section.

According to a second aspect of the present invention there is provided an apparatus for introducing a component into a first liquid, the apparatus comprising:
a first container for holding the first liquid having an opening closed by a releasable closure,
a second container located in the first container and containing propellant fluid, and
a conduit having a first end communicating with the second container and a second end communicating with the first container;
wherein the conduit contains an additive which is expelled from the conduit into the first liquid by the entry of the propellant fluid into the conduit on release of the releasable closure;
and wherein the conduit is provided at its second end with a valve according to the first aspect of the present invention.

Preferably the conduit comprises a plastic tube, at the lower end of which is formed the tubular member.

Preferably the conduit extends below the surface of the first liquid in the first container. Alternatively the conduit may extend to a position close to the wall of the first container above the surface of the first

liquid, to avoid foaming of the liquid and the creation of pressure waves in the liquid. The first container may be a bottle having a neck, and the conduit may extend to a position adjacent to the wall of the neck.

The conduit may contain a number of additives arranged at different positions along the length of the conduit. The additives are preferably liquid. The additives may be colouring agents, flavouring agents, fragrances, pharmaceutical components, chemicals, nutrients, liquids containing gases in solution etc.

Examples of apparatus in accordance with the invention will now be described with reference to the accompanying drawings, in which:-

Figs. 1(a) to 1(e) are cross-sectional views of a first embodiment of an apparatus of the invention, in which the second container is integrally formed in a bottle top, showing the top before screwing on, during screwing on, screwed on tight, during release and fully removed respectively;

Fig. 2 is a cross-sectional view of the embodiment of Fig. 1(a) to an enlarged scale;

Fig. 3 is a longitudinal cross-sectional view through a first embodiment of the valve of the invention in its closed state;

Fig. 3a is a section on line X-X through the valve of Fig. 3;

Fig. 4 is a longitudinal cross-sectional view through a second embodiment of the valve of the invention in its closed state;

Fig. 4a is a section on line Y-Y through the valve of Fig. 4; and

Figs. 5 to 7 are longitudinal cross-sectional views through third, fourth and fifth embodiments

respectively of the valve of the invention in its closed state.

Figs. 1(a) to 1(e) show an apparatus for automatically dispensing a product from a dip tube to a bottle or first container by means of pressurised propellant stored in a tank or second container when the top is removed from the bottle. The tank or second container is integrally formed with a screw top which is then screwed onto the bottle or first container, in the neck of which is secured an insert which has a rupturing spike and a dip tube.

Fig. 1(a) shows a bottle 150 having an insert 100 secured within the neck 160 of the bottle, shown in more detail in Fig. 2. The screw cap 152 is shown separately, before closure of the bottle 150. The cap 152 has an internal thread to mate with the external thread on the neck 160 of the bottle. The cap has an integrally moulded cylindrical portion which forms an inner container 111, which is closed at the upper end by a convex portion 112 of the cap 152, so as to resist internal pressure in the inner container, and is open at the lower end 113. A circumferential groove 114 is provided externally at the lower end 113 of the inner container 111.

A plastic ferrule 170 comprises an inner cylindrical wall 172 forming a chamber which is open at its lower end and closed by a foil seal or membrane 180 at its upper end. The inner cylindrical wall 172 is connected and sealed at its upper end to an outer cylindrical wall 174, whose outside diameter is selected to fit tightly within the inside diameter of the inner container 111. At the lower end of the outer cylindrical wall 174 is provided a return flange 176

which has a circumferential rib 178 adapted to cooperate with the groove 114 on the outside wall of the inner container 11. The inner wall 172 has upper and lower sealing ribs 182, 183 which are adapted to provide a pressure resistant seal against the outer surface of the rupturing member 104.

The ferrule 170 is secured by a snap fit to the lower end 113 of the inner container 111, to provide a pressure resistant closure to the container. The inner container is filled with liquid 115 and pressurised gas 116 in a conventional fashion, so that the inner container is under internal pressure, causing the foil seal 180 to bow outwards.

An insert 100 is secured by any suitable means within the neck 160 of the bottle 150. The insert 100 comprises a substantially cylindrical housing 101 open at the upper end and having a number of legs 190 projecting from the lower end. The housing is provided with detent members 191 which engage with the inside of the neck 160 of the bottle, so that the insert 100 cannot be readily removed. The upper end of the housing has a lip 102 which is adapted to engage with a recess 103 in the neck 160 of the bottle, to prevent the insert from being pushed down inside the neck.

The legs 190 are connected at their lower end to a hollow spike member 104, which has a small diameter bore portion 105 at its upper end and a large diameter bore portion 106 at its lower end. Between the legs are apertures which allow the passage of liquid between the spike member 104 and the side of the bottle when the liquid is poured from the bottle. The number of legs and intervening apertures may be two, three, four or more as appropriate.

Within the wall of the small diameter bore portion 105 are provided a number of radial passages 108 which communicate with the hollow interior of the spike 104 and the interior of the housing 101. Extending from the bottom of the hollow rupturing member 104 is a dip tube or conduit 130, surrounded by a plastic or sprung steel cone washer 109 which is secured to the rupturing member 104 and serves as a one-way retaining member to allow the conduit 130 to be inserted up into the large diameter bore 106 but to restrain it from being removed in a downwards direction. The large diameter bore portion 106 has an internal diameter equal to the external diameter of the dip tube 130. The step between the large and small diameter bore portions 105, 106 prevents the dip tube 30 extending into the small diameter bore portion 105 and blocking the radial apertures 108.

In use, the inner container 111 is filled with a liquid 115 and a pressurised gas 116 by means of conventional technology used to fill pressurised dispenser packs, commonly known as aerosol containers. Alternatively the inner container 111 may be filled solely with pressurised gas 116, omitting the liquid 115.

Fig. 1(b) shows the cap 152 while it is being screwed on to the neck 160. On application of the closure or cap 152 to the bottle 150, the inner container 111 is moved downwards and the spike 104 enters the space formed by the inner cylindrical wall 172 of the ferrule 170.

When the closure 152 is fully screwed tight on to the bottle 150, the inner container 111 moves to the position shown in Fig. 1(c), in which the seal member 154 inside the cap 152 seals tightly against the top

156 of the bottle neck 160. When this happens, the spike 104 bursts the rupturable membrane 180 and the member hollow spike extends into the inner container 111. In this position the liquid 115 and gas 116 are prevented from escaping from the inner container 111 by the ferrule 170 and spike member 104 which seal against each other to prevent release of the liquid 115 and gas 116 from the container 111. The upper sealing rib 182 and lower sealing rib 183 formed inside the inner cylindrical wall 172 of the ferrule 170 both seal against the outer surface of the spike member 104.

The inner container 111 remains in the position shown in Fig. 1(c) until a user releases the closure 152 from the bottle 150. When this occurs, the inner container 111 moves to the position shown in Fig. 1(d). In this position the upper sealing rib 182 becomes unsealed from the spike member 104, but the lower sealing rib 183 remains in sealing contact with the outer surface of the spike member, below the apertures 108. This leaves an escape passage for the compressed liquid 115 (or gas 116), which is forced out of the container 111 by the pressurised gas 116 in the direction of arrows 184, 185, 186, between the spike member 104 and ferrule 170, through the radial passages 108 and into the dip tube 130. The liquid 115 or gas 116 then passes through the dip tube 130, expelling the concentrate or additive material 131 from the dip tube 130 through the valve 200, shown schematically in Figs 1 and 2, into the liquid or other substance contained in the bottle 150. On removal of the closure 152, the inner container 111 and ruptured ferrule 170 are removed from the bottle 150 together, as shown in Fig. 1(e), leaving the insert 100 and dip tube 130 in the bottle. The insert does not impede pouring of the liquid in the bottle, which can flow between the support legs 190 of

the insert 100.

The dip tubes 130, typically thin-walled polypropylene tubes such as used in the manufacture of drinking straws or similar, may be of different diameter or length and may contain different predetermined doses of additives.

Figs 3 to 7 show five different embodiments of the valve 200 provided at the lower end of the dip tube 130. In all cases the material 131 is held in the dip tube by the flattened end portion of the dip tube, and cannot exit from the dip tube until the dip tube is pressurised, causing the flattened end portion to open.

In the first embodiment of Fig. 3 the lower end of the dip tube 130 is provided with a flattened, duck bill shaped end portion 201. This arrangement requires a significant internal pressure before the valve will open, since the natural spring action of the inner wall 202 means it must "pop" open away from outer wall 203.

In the second embodiment of Fig. 4 the lower end of the dip tube 130 is provided with a simple, planar, flattened end portion 211. The heating action means that the two walls 212, 213 are in equilibrium in the closed position.

In the third embodiment of Fig. 5 the flattened end portion 221 is folded back on itself, to provide a more secure closure. A high internal presuure is required, first to expand the upper portion 222 of the flattened end portion 221, and then to cause the fold 223 to straighten out, before the lower portion 224 can expand. The heating action means that the fold 223 is in equilibrium in the folded position.

The fourth embodiment of Fig. 6 is similar to that shown in Fig. 5, except that there are three folds 232 provided in the flattened end portion 231. Two or four or more folds may be provided if required.

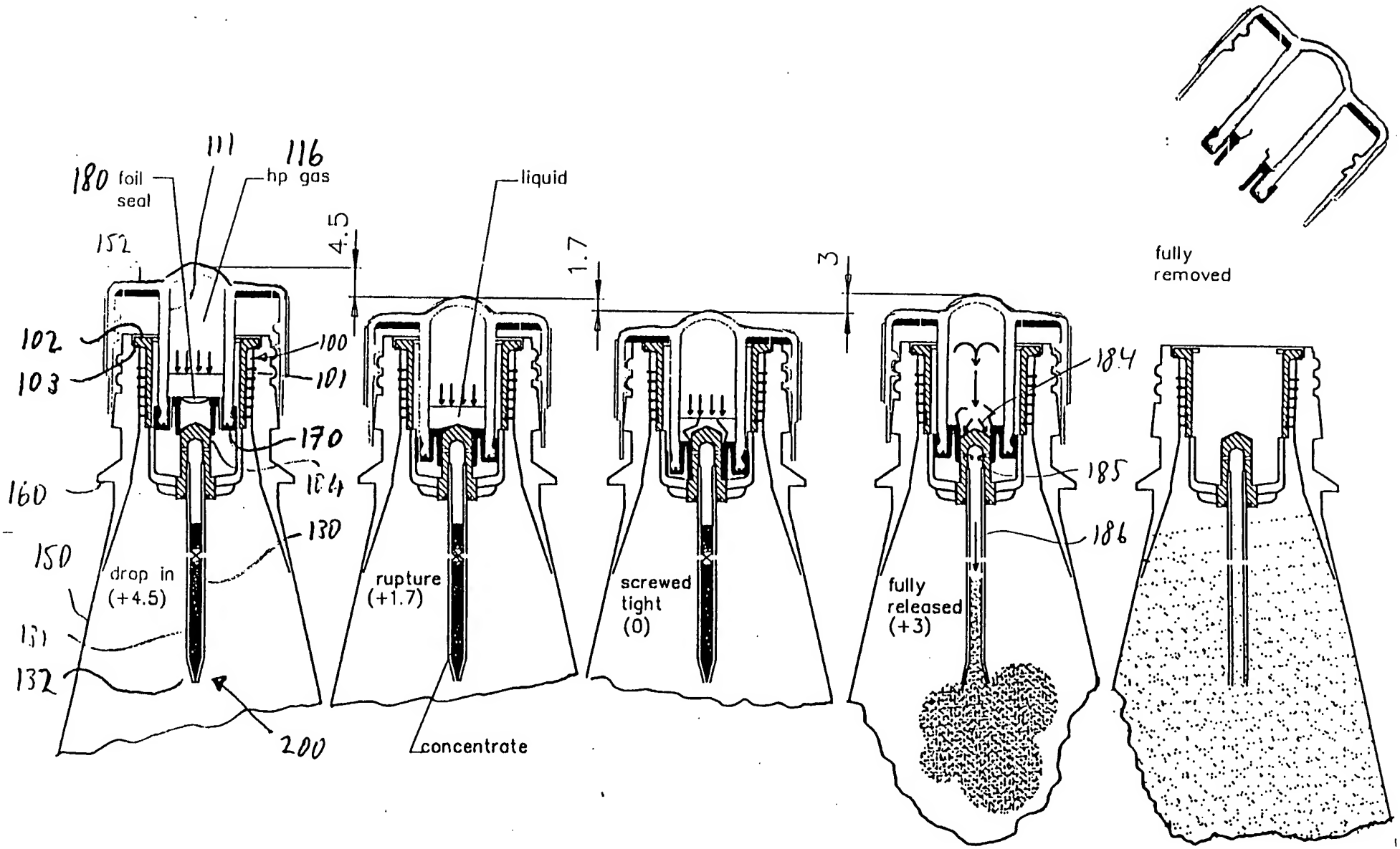
In the fifth embodiment of Fig. 7 the flattened end portion 241 is rolled in a coil, which unrolls upon the application of internal pressure to the dip tube 130.

It is envisaged that the dip tube valve arrangement may find other applications, and the invention is not be limited to use of the valve with a pressurised dispensing device as shown in Figs 1(a) to 1(e).

The invention can be used with fragrances, flavouring, pharmaceuticals (particularly suitable because of the accurate dosage obtainable), chemicals, vitamins etc. The tubes can be filled precisely at a different location and then inserted into the housing at the point of filling the bottles. Compressed air or other gas is particularly suitable as a propellant for powdered or granulated solids, so that liquid does not cause the solids to adhere to the side of the dip tube.

Modifications and improvements may be incorporated without departing from the scope of the invention.

Fig. 1(a) Fig. 1(b) Fig. 1(c) Fig. 1(d) Fig. 1(e)



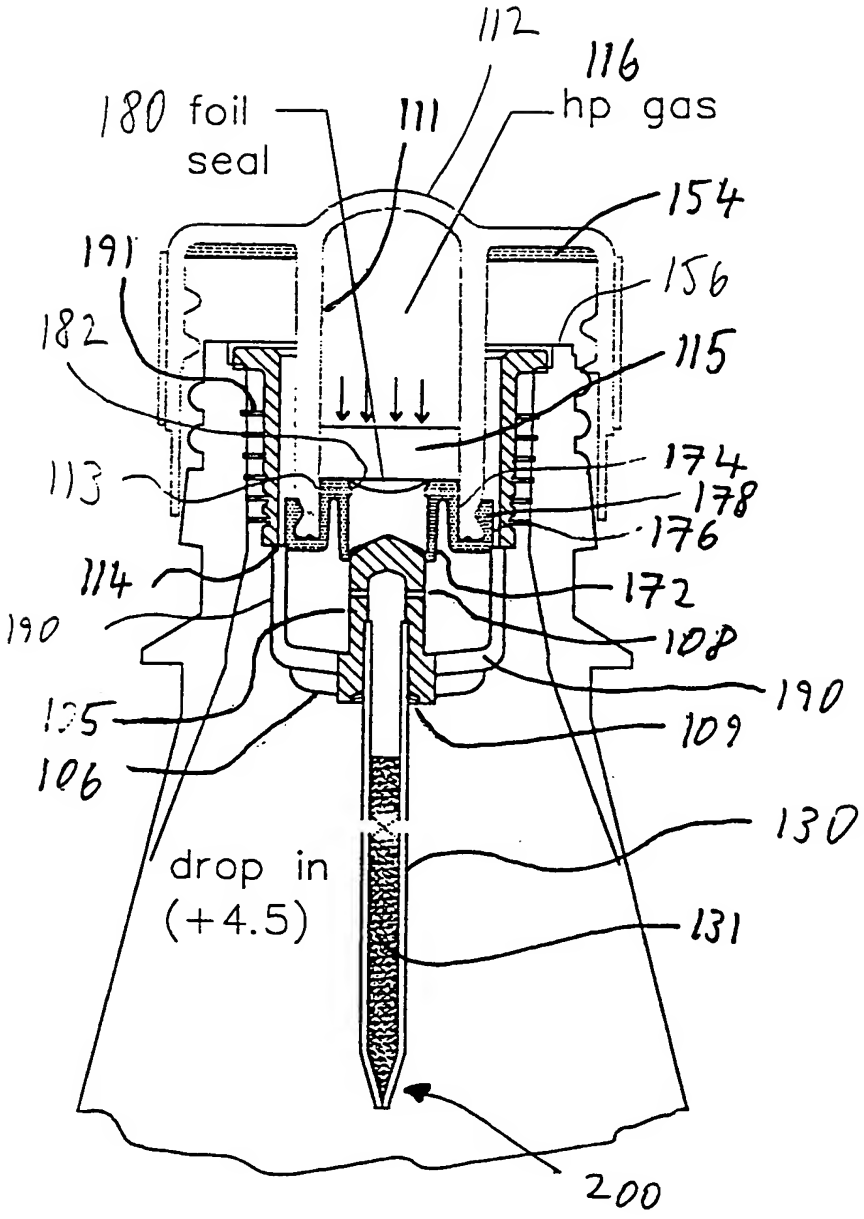

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Fig. 2

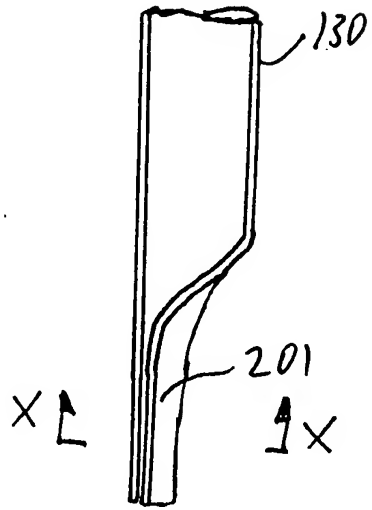

FIG. 3

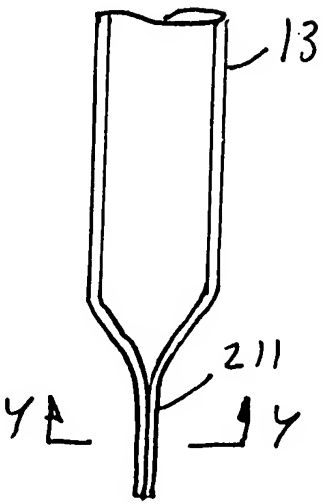

FIG. 4

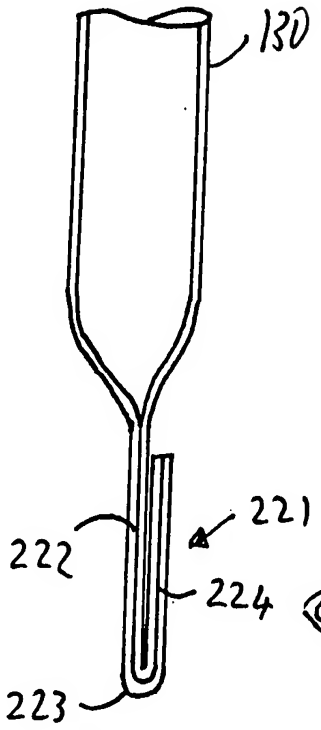

FIG. 5

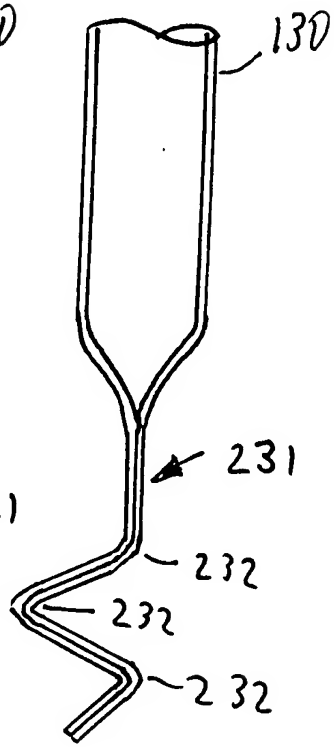

FIG. 6

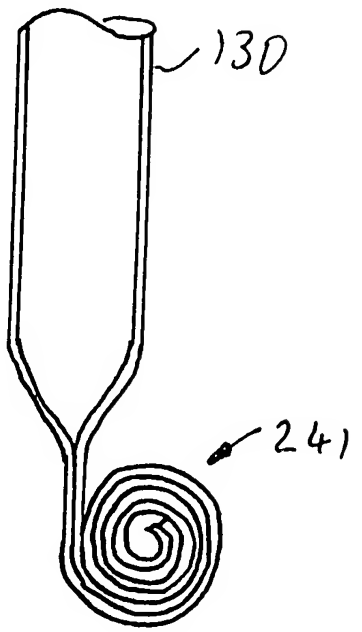

FIG. 7

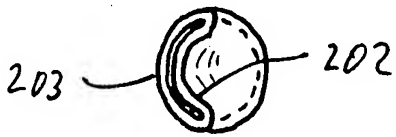

FIG. 3a

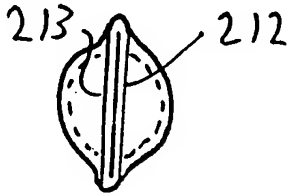

FIG. 4a

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